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Microwave detection of cosmic ray air showers at the Pierre Auger Observatory, an R&D effort

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Microwave emission from ultra-high energy cosmic ray (UHECR) air showers presents the possibility of developing a novel detection technique. This new technique possesses the advantage of the fluorescence detection technique - the reconstruction of the longitudinal shower profile - combined with a 100% duty cycle, minimal atmospheric attenuation and the use of low cost commercial equipment. Placing prototype detectors at the Auger site provides for coincidence detection of air showers using established methods, ultimately assessing the feasibility of detecting air showers with microwave emission. Two complementary techniques are currently being pursued at the Pierre Auger Observatory. MIDAS (Microwave Detection of Air Showers), AMBER (Air-shower Microwave Bremsstrahlung Experimental Radiometer), and FDWAVE are prototypes for large imaging dish antennas. EASIER (Extensive Air Shower Identification using Electron Radiometer), the second technique, utilizes horn antennas located on each Auger Surface Detector station for detection of microwave emission. MIDAS is a self-triggering system while AMBER, FDWAVE and EASIER use the trigger from the Auger detectors to record the microwave emission. The development status and future plans for these measurements will be reported.

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